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NEW YORK, SATURDAY, JANUARY 7, 1899.

A RETROSPECT OF THE YEAR 1898.

The year which has now drawn to a close will go down to history as marking one of the three great epochs in the history of the United States. The year 1776 saw the birth of this Republic; in 1865 its unity was proved and declared to be forever indissoluble; and, unless the present signs miscarry, the year 1898 will mark the era of its worldwide expansion. At each crisis the guidance of the good ship of state was in the hands of men of unquestioned patriotism and integrity, who acted for a strong majority of the people. The brilliant history which records the making of this, the latest and most virile of the great peoples of the earth, proves that in 1776 and 1865 the majority was right. And what of 1898? The chief executive of the nation declared war upon Spain with the practically unanimous consent of the country, and in less than thirty days we found the widespread colonial possessions of Spain within our grasp, and the tremendous problem of worldwide empire confronting us. In the contemplation of the only alternatives of advance or retreat we have deliberately, and with, we believe, a clear sense of the grave and altogether untried responsibilities involved, decided to break away from the traditions of the past and take our stand as one of the great colonial powers of the world.

Whether this momentous step will redound to our profit or lead to our undoing will depend upon the spirit in which we enter upon our new possessions and administer their affairs. "Men at some times are masters of their fate," and the "fault . . . will not be in our stars but in ourselves" if we fail to bring peace, contentment, and prosperity to the new and strange peoples that have become subject to our administration. We believe, however, that the very magnitude of the trust imposed will impress upon Congress the necessity of abolishing so-called "politics" from our colonial affairs and administering them with a single eye to the fair name of America and the best interests of the races which we have rescued at the cost of much blood and treasure from a burdensome despotism.

By no means the least fortunate result of the war is the repairing of those bonds, "strong as steel, yet light as air," which once again unite England and America—bonds of common lineage, language, laws, religion, and feeling, the severance of which the great Burke so eloquently deplored a century and a quarter ago. The best guarantee of the depth and permanence of the present understanding is the fact that its existence is not now and probably never will be imperiled by embodying it in the terms of a formal treaty.

Brief as it was, the war served greatly to increase the prestige of our navy in respect of its discipline, personnel and material. As regards the army, it proved that the fighting qualities of the American soldier of to-day are fully up to the high standard shown on the desperate battlefields of the Civil War. Manila and Santiago take rank with Mobile Bay and the Mississippi, while San Juan and El Caney are comparable in the desperate bravery of the combatants to Antietam and the final charge at Gettysburg. If we except the monitors, our ships acquitted themselves admirably; we do not know of a single case, among the larger vessels, of absolute breakdown, and the failure of the torpedo boats was only what everyone looked for. Guns and mounts gave general satisfaction; and the breakdowns, both in ships and guns, were in matters of detail only and were easily repairable. The war has brought home to the country the absolute necessity for an increase in our naval and military forces, and it is likely that before the year is many weeks old our standing army will have been increased to 100,000 men, and a general appropriation will have been authorized for new battleships and cruisers of the most approved construction.

Next to the Spanish-American war the most notable occurrence of the year is the remarkable victory which was gained by the British forces in the Soudan. The overthrow of the Mahdist forces is a triumph of civilization over barbarism, and it brings the fairest of the equatorial provinces of Africa under the dominion of a people who have proved to be the most successful and beneficent colonizers in the history of the world. The Eastern Question has shifted from Constantinople to the far East, and has resolved itself as befits the spirit of the times from a military problem to a problem of trade and commerce. "The open door" is the watchword of that side of the controversy to which our interests and the logic of events appear to be insensibly leading us.

The new year opens auspiciously for the prospects of industry and trade, and the improvement is the more encouraging because it has been gradual and gives promise of being permanent. The most gratifying fact is the secure hold which we are obtaining upon foreign markets, as evidenced by the increasing demand for goods of American manufacture. The increase in our exports is being accompanied by a marked decrease in imports, and we are evidently fast approaching a time when we shall be absolutely independent of the European markets except in a few special and limited lines of manufacture. Very significant events in the trade between this country and Great Britain were our shipments to that country of coal and ship plates and the recent order for American locomotives. It is true the orders for coal are stated to have been due to the coal strike, and the shipment of shipbuilding material and locomotives to the inability of British manufacturers to keep up with their orders; but the ground has been broken, and it is more than likely that these orders will prove to be an open door of a permanent trade in these commodities.

Again we have to record a dearth of new construction of any magnitude in the sphere of civil engineering. The Siberian Railroad continues to be the greatest engineering project under way, and through the past year it has been pushed forward with tireless energy. This colossal work, moreover, has taken on greater significance because of its being the actual key to the Eastern Question as far as Russia is concerned. Every rail that is laid, every spike that is driven, is another link in the chain by which the Russian Empire seeks to bind the destinies of Northern China to its own. The latest estimates place the completion of the road as far off as the year 1903 to 1904. The United States are concerned more with betterments of existing railroads than the construction of new lines, although a total of 1,652 miles was added during the last fiscal year, the total length of all roads being now 184,428 miles. The largest bridge under construction is the new suspension bridge across the East River, New York, which will have a length between towers of 1,600 feet and a width of 118 feet. The foundations of the towers are all completed and the anchorages are under construction. It is likely that the stringing of the cables will commence some time in the summer or early autumn of this year. It is proposed to double the capacity of the existing New York and Brooklyn suspension bridge by double-decking the floor system and adding four supplementary cables above the present cables. It is not unlikely that another bridge will be commenced across the East River to the north of the new bridge now under construction. The year has seen the erection of a new pin-connected bridge across the St. Lawrence, at Montreal, in place of the famous tubular bridge, built nearly half a century ago by Robert Stephenson, and a handsome steel arch has also been built below Niagara Falls, replacing the old suspension bridge, the site of which it occupies. In this connection it may be mentioned that early in the present year, work will be commenced on a suspension bridge to replace the old Lewiston bridge, which was wrecked several years ago. The massive drawbridge across the Harlem River on Third Avenue, New York, which weighs 2,500 tons, has been opened for traffic, and preliminary steps have been taken toward the erection of a similar structure over the same river. The great North River suspension bridge exists as yet only on paper. Badly as it is needed, great as would be the benefit conferred, the estimated cost of $60,000,000 is evidently regarded as prohibitive. We have to record one of the most fatal bridge accidents of recent years in the fall of the new Cornwall bridge, when a river pier and two 370-foot spans fell into the river. The failure was probably due to erosion of poorly designed foundations.

Under the head of transportation there has been very little development of an abnormal character. Locomotives and trains have continued to grow in weight, and the records of one year are regularly exceeded in the next. As regularly as the prophets declare that the limit has been reached, the locomotive builders prove that it has not, by making big increases in cylinders, boilers and total weight. Early in the year the Brooks Locomotive Works produced for the Great Northern Railway a monster freight locomotive weighing 106 tons, with cylinders 21 by 34 inches and 3,280 square feet of heating surface; yet a few months later, this was exceeded by the Pittsburg locomotive of 115 tons, with cylinders 23 by 32 inches and 3,322 square feet of heating surface. The fact that practically nothing is being done in this country in the way of novel and experimental locomotives goes to prove that locomotive engineers are well satisfied that finality of type has been reached. In England there has been a revival of interest in four-cylinder locomotives, no less than four different roads having placed engines of this kind on the road. In France the Heilmann electric locomotive is still on trial, but nothing very definite has been given out regarding results. Railway speeds have remained stationary, the credit of running the fastest regular train in the world still belonging to the Philadelphia and Reading Railroad, a train from Philadelphia to Atlantic City making the run of 55½ miles at the rate of 66·6 miles an hour.

The last year has not been marked by the sensational performances in ocean transportation which characterized the preceding year. The "Kaiser Wilhelm" of the North German Lloyd has not surpassed her record of 22·35 knots an hour for the whole trip across the Atlantic, although she is said to have steamed for one whole day at an average speed of 23 knots, a feat which was about equaled by an older ship, the "Lucania," which maintained 22·9 knots for an all-day run. The "Kaiser Friedrich," which is practically a sister ship to the "Kaiser Wilhelm," and was designed to exceed the latter vessel in speed, has been somewhat of a disappointment, having failed to come within 1½ knots of the speed of the earlier vessel. The Hamburg-American line are building a 16,000 ton vessel to steam 23 knots, and the "Oceanic" of the White Star line, of 17,000 tons and 704 feet long, will be in service during the coming summer. The greatest interest at present attaches to the huge freight ships which are being constructed in increasing numbers and of ever-increasing dimensions. Several of these will draw 32 feet of water, and a strong movement is now on foot to have the government deepen the entrance channel to New York Harbor to 35 feet, so as to accommodate the expected increase which will yet take place in the draught of future ships. The year has been fruitful in disasters at sea. The shocking loss of life in the foundering of the "Bourgogne," the "Mohegan," and the "Portland," proves that with all our boasted improvements in ships and seamanship, we have yet to learn how to render ocean travel reasonably secure.

Electricity continues to assert itself as the most suitable power for city and suburban traffic. In the former it is supreme and for suburban travel it is growing in favor. The interest of the great railroad systems in the question of substituting electric for steam traction on their suburban and branch roads has not been so marked as it was in the preceding year; but experimental work in this direction is being carefully watched with a view to future developments. The success of the existing underground electric roads in London has led to proposals for the building of several other important lines of this kind. Orders for the equipment of these roads continue to find their way to this country. The most remarkable electric system at present under construction, in this country, is that of the Metropolitan Street Railway Company, in New York city. During the year underground trolley lines have been built on two of the avenues, and the well known Broadway and Lexington Avenue cable roads are being electrically equipped. The many advantages of the new motive power over the old are self-evident to the traveling public, and the underground trolley has evidently come to stay for good, or until some unthought of and better system shall take its place. Undoubtedly the most important development in transportation has been the remarkable success of the automobile carriage in this country. The horseless cab has established itself as a thoroughly practical and popular means of travel with the general public in New York, while its high speed, its ease of control, its comparative noiselessness and its convenience for use in the city in place of the two-horse carriage is rendering it increasingly popular with the wealthier classes. The electric cabs of New York are standing the test of winter work, and, during the recent snow-storms, they ran under conditions which discouraged even the horse cabs.

No record of the year would be complete without mention of the very successful Trans-Mississippi and Omaha Exposition which was held during the summer months in the flourishing Western city from which it took its name. The enterprise was conceived and carried out with characteristic Western zeal and enterprise. In thirteen months from the day on which the first spadeful of earth was turned the work of preparation was completed, and this in spite of the prevailing commercial depression. Some $2,000,000 was spent upon the grounds and buildings, and these were laid out with a landscape and architectural effect that rivaled that of the Chicago Fair. The Exposition was in every respect an unqualified success.

The record of new naval construction during the year is particularly gratifying when we bear in mind that it was carried on in spite of the severe pressure put upon our resources by the Spanish war. In the twelve months we launched no less than five first-class battleships of 11,525 tons displacement, making a total of 57,625 tons in battleships alone, thereby more than doubling the battleship force of our navy in one year's addition. The ships are the "Alabama," "Illinois," "Wisconsin," "Kearsarge," and "Kentucky;" the cruisers "Chicago," "Newark," and "Atlanta" have

been reconstructed, refitted, and rearmed, the changes making them thoroughly up-to-date vessels; and the improved plans of the new "Maine," "Ohio," and "Missouri" have been passed and the contracts let. The opening of the year finds us with eight first-class battleships, aggregating 95,125 tons, under construction for the navy, and it is gratifying to know that the whole of this work is being done in private yards. Our latest battleships of the "Maine" class will be or rather are now the most powerfully armed vessels of their class, and their speed of 18 knots is up to the present standard of other navies.

The most notable fact in connection with our ordnance is the decision to use smokeless powder exclusively in our future guns, and the proposal to make 3,000 feet per second the standard velocity for all the large rifles. Great interest also attaches to the Hobbs single-forging gun and the Gatling cast steel gun, both of which have shown good results in tests at the government proving grounds. Krupp armor still continues to hold the first place against all competitors. The government has wisely decided to adopt the Krupp system in the manufacture of its plates, and both Carnegie and the Bethlehem companies have produced plates of phenomenal endurance, the latter plate, 6 inches in thickness, having resisted the attack of six 8-inch armor-piercing projectiles without failure.

Science has again been enriched by the discoveries of Prof. Ramsay. In June of last year Ramsay was able to announce the discovery of "krypton" as one of the gaseous elements of air, the new gas being recovered from some liquid air which was being made the subject of experiment. Shortly afterward the same brilliant experimentalist, with the help of his assistant, Maurice Travers, discovered two other elements of the atmosphere, which were named respectively "neon" and "metargon." This result was made possible by the discovery, jointly, by Lord Rayleigh and Prof. Ramsay last year of argon, the new elements being obtained from a quantity of liquefied argon. Prof. Dewar, whose name is associated with the liquefaction of air, also succeeded in liquefying hydrogen at a temperature of —205 degrees Centigrade. M. and Mme. Curie report the discovery of an element which they call "polonium." It resembles bismuth, but is of far greater radiating power than uranium. Mr. Charles F. Brush announced at the Boston meeting of the American Association for the Advancement of Science that he had succeeded in eliminating from the atmosphere a gas which he calls "etherion." Its conductivity of heat is a hundred times as great as hydrogen. Sir William Crookes, in examining some rare earths used in the manufacture of the Welsbach mantle, discovered a new element, which he named "monium." It is heavier than "yttrium," but lighter than "lanthanum," its atomic weight being estimated at 118.

A notable event of the year was the production of liquid air in commercial quantities by Mr. C. E. Tripler, of New York. This is done by the development of the method of expansion in an ingeniously devised apparatus. The liquefaction is produced by the "self-intensification of cold," produced by the expansion of compressed and cooled air, no other substance being used to bring about the result. The boiling point at atmospheric pressure is —191° Centigrade, and the value of such a liquid, produced in commercial quantities, for laboratory purposes is obvious. Just how much commercial value liquid air will possess has got to be decided. Attempts are already being made to produce a liquid air motor.

In connection with our mention of Boston as the meeting place of the American Association for the Advancement of Science, it should be recorded that the past year was the golden anniversary of this well known institution, which at present boasts of a roll of 1,610 members.

The obituary of the year contains many names that will be sadly missed from the various fields of science and art in which they labored. Sir Henry Bessemer, who has had more to do with the industrial development of the nineteenth century than any other man, died on March 14. At the time the fiftieth anniversary number of the SCIENTIFIC AMERICAN was published, the readers of our journal put themselves on record as considering that the Bessemer process was the greatest invention of the last fifty years.

Dr. John Hopkinson was another Englishman whose death leaves a considerable gap in the front ranks of science. There is scarcely a branch of electrical work that does not owe something to his thought and labors. His improvement of the Edison dynamo, and his three-wire patent, which he disposed of to the Westinghouse Company for $100,000, are among his well-known achievements.

The death of Colonel George E. Waring, Jr., is lamented, not alone in the United States, his native land, but in every part of the civilized world where his writings have made him known. This soldier-engineer was distinguished by his work in many fields of industry and occupation; but his most brilliant success was achieved in recovering New York city from the disreputable state of filth in which Tammany corruption had permitted it to lie, and systematizing a street cleaning force which was a model of system and efficiency. He is to be reckoned as one of the martyrs of the war, having contracted yellow fever during his inspection of Havana with a view to its sanitation.

The death of Latimer Clark has reduced the number of those who are connected with the earlier development of land and submarine telegraphy. Together with his partner, Sir Charles Bright, he acted as engineer in the making and laying of the second and third Atlantic cables, and in all his firm was connected with the laying of 60,000 miles of submarine cables.

Prof. James Hall was a scientist whose death was noted with regret, not only in his native land, but in the many foreign countries where he was honorably known. He was the State Geologist of New York for sixty-one years, and one of the most industrious men in an industrious age. Although he died at the age of eighty-seven, he was able during the last ten years of his life to write 250 papers on scientific subjects. His life work was paleontological study.

In the lamented death of Joshua Rose, who was one of the editors of Appleton's "Cyclopedia of Applied Mechanics," "Modern Steam Engines," "Modern Machine Shop Practice," and numerous other well known works, the SCIENTIFIC AMERICAN lost one of its early contributors. Mr. Rose was an accomplished writer and a voluminous contributor to the technical press.

We close our review of the year with mention of another distinguished engineer among those we have mentioned as having passed away—Sir John Fowler, perhaps best known for his work as the designer of the great Forth Bridge in Scotland. His work covered almost every branch of engineering, for much of it was done in the earlier half of the century when specialization had not been carried to the extent which characterizes the present day.

REMARKABLE USES OF PEAT.

BY OLIVER C. FARRINGTON.

One of the most interesting and attractive exhibits at the Vienna Exposition of last year was a building containing the most diverse articles made from peat. Everything in the building, from the carpets on the floor to the curtains at the windows and the paper on the wall, had been made from peat. These were but representatives of what will undoubtedly soon become a great industry and give to the peat bogs of the world a value never before dreamed of.

Credit for the discovery of the possibilities of peat belongs chiefly to a Vienna gentleman, Herr Karl A. Zschörner. His investigations into its nature began some twelve years ago with a study by means of the microscope of what is called in Austria "torfstreu." This is the layer of moss which covers the surface of most peat bogs. It has hitherto, by those who have made use of the peat for fuel, been at considerable expense removed and thrown away. Herr Zschörner's examination showed that the plant remains which make up this layer abound in hollow, spiral cells. These absorb water and other fluids with great avidity. While ordinary straw cannot absorb over four times its weight of fluids, this peat straw will absorb ten times its weight. The peat straw, moreover, possesses the antiseptic and disinfectant qualities of peat, qualities which have long been known, but of which little use has been made. Herr Zschörner accordingly hit upon the idea of drying the straw and using it as an absorbent in stables, breweries, and various manufactories. For such purposes it proved most admirably adapted, and the demand for the product soon grew large. Having greater absorptive power than ordinary straw, the peat straw can be used much longer in any given place and yet will have proportionally greater manurial value. It gives a healthy, resilient footing also for animals. For packing of both perishable and breakable articles it is also better than ordinary straw, since it is more elastic and less easily penetrated by heat and cold. Another form of peat which was found to be a better absorbent for some places was the peat itself, dried and ground to a powder. This is especially adapted for use in earth closets and about sinks and drains, its absorbent power and disinfectant properties making it admirably adapted for these uses.

Herr Zschörner did not rest his investigations here. A further study of the peat itself showed that it was very largely made up of fibers. These fibers come from the remains of reeds and grasses, which, growing and dying in successive generations, form the peat. In their submergence the reeds and grasses suffered no anatomical change, but their physical and chemical character became entirely different. The organic substance of the plant became inorganic, so that nothing capable of fermentation or decay was left, while the fibrous structure remained intact. These fibers then were found to have unusual physical properties. They were found to be very durable, very elastic, to be non-conductors of heat and non-combustible.

If a fabric could be woven from them, it would be one possessing unique properties. To the toughness of linen it would add the warmth of wool, an absorbent power greater than that of cotton, and the indestructibility of asbestos. It must, however, be woven without the aid of oils or water, or much of its value would be lost.

After twelve years of experimenting, Herr Zschörner succeeded in making the peat fibers weavable. There is now, therefore, scarcely any textile article which cannot be made from peat. Coats, hats, carpets, rugs, ropes, matting, and pillows are some of the articles which have been made, and have been found useful. What superiority these will prove to have in practice over fabrics made from other fibers, only time will tell. Some of them have, however, already been proved to be immensely superior to any other fabrics. This is especially true of the blankets and other coverings used for horses and cattle, for they greatly excel in warmth, absorbent power, cleanliness, and durability. The unspun fiber promises to be a valuable substitute for absorbent cotton, since it will not only absorb a much greater quantity of blood and other fluids than cotton, but it possesses powerful antiseptic properties as well. The coarser fiber it is expected will come into favor for use in upholstery work, its extraordinary elasticity making it most valuable for this purpose.

The latest achievement of the discoverer of the uses of peat has been the making of paper from its fiber. This has been carried to such an extent that paper of almost every variety of weight and quality can be made, while the toughness and durability of each is equal to that of paper from any kind of vegetable pulp. The above are but a few of the uses to which this remarkable fiber can be put, but they indicate possibilities which may yet rank peat bogs among the most valuable of the world's resources.

AUTOMOBILES FOR FIFTH AVENUE.

For many years the last relic in the way of stage lines in New York has been the Fifth Avenue line, but the service has not been very satisfactory to the public and the franchise has now been acquired by the Third Avenue Railway Company. This line will be equipped in a short time with automobile carriages of some kind. If this is done, the line will be a valuable feeder to the various crosstown lines owned or leased by the Third Avenue Railway Company. The present service is slow and irregular, and for a long time the stage company had been examining various methods of traction. It is not probable that tracks can ever be laid in any part of Fifth Avenue, as public opinion as well as property holders are entirely opposed to it.

There is no objection, however, to the noiseless and cleanly horseless omnibus or stage, which will leave the street in a good sanitary condition. Of course, the Fifth Avenue line of stages must necessarily compete with the Madison and Fourth Avenue electric lines, and for a long distance it runs parallel with them; but while automobile vehicles cannot be operated as cheaply as the underground trolley, still the margin of difference is not so great as to prohibit their use, and, as we have already stated, the line would be valuable as a feeder to the various crosstown lines. There are many people who have used the stage line for years and who will probably continue to do so, and from a scenic point of view nothing can be finer than a ride up Fifth Avenue in a modern omnibus. There is no crush of travel as there is on many of the adjacent streets, so that the trip is more enjoyable, and the line will certainly come in for a considerable percentage of the "short haul" business, which pays very well and it is admirably adapted for this kind of transportation.

During the storm on November 26, the electric automobile vehicles behaved remarkably well. They ran throughout the entire night, and the last one only came in about six o'clock in the morning, when the snow must have been from eight to ten inches deep, and the carriages had no difficulty whatever in forcing their way through drifts which were much deeper than this. Horse cab companies turned over orders to the electric company rather than fill them themselves. Of course, the mileage per charge of battery was reduced. The motors and batteries acted admirably. One reason of their success was undoubtedly due to the large pneumatic tube tires, which are five inches in diameter and give a large and resilient bearing surface.

A BURNISHED finish on the journals of axles for railway carriages and locomotives has given good service, and has been used on many roads for a long time, says The American Engineer. The advantage of it is to smooth the surface of the journal after the finishing cut, and to shorten the period of breaking in. The burnishing is done by three rollers carried on a tool rest and bearing against the journal, considerable pressure being obtained by a screw. The rest is fed along so that the finishing cut and the burnishing are done at the same time. Mr. Atkinson, of the Canadian Pacific, uses the burnisher on piston rods, and intends to use it on valve rods, as well as on journals. He stated, at the recent Master Mechanics' Convention, that it gave the best finish that he knew of for piston rods.